



CHAPTER 5

Transportation Economics

Highlights

- Total spending on transportation fell in 2008 after the onset of the 2007–2009 economic recession, returning in 2014 to the pre-recession level.
- In total, the public and private sectors spent \$125.7 billion on transportation construction in 2014.
- The transportation revenues of federal, state, and local governments totaled \$180.2 billion in 2012, while government transportation expenditures totaled \$319.8 billion—a deficit of \$139.6 billion, down from \$152.3 billion in 2009.
- Personal, business, and government purchases of transportation goods and services accounted for 8.9 percent of U.S. gross domestic product in 2014.
- All freight traffic and passenger travel, as measured by the Transportation Services Index (TSI), declined during the 2007–2009 economic recession but rebounded in 2014. The passenger TSI lagged the freight TSI in recovery.
- Transportation and related sectors employed over 12.3 million workers in 2014, representing 8.8 percent of the Nation’s labor force.
- The highest wage transportation-related occupations employ relatively few workers, while the lower wage occupations employ millions. Air traffic controllers, airline pilots, and aerospace engineers had an annual median wage of more than \$100,000 in 2014 and employed 167,000, while the largest transportation-related occupation, heavy and tractor-trailer truck drivers, had an annual median wage of \$39,520 and employed over 1.6 million.
- American households spent, on average, about \$9,000 per year on transportation in 2014, representing 17.0 percent of household expenditures. Transportation expenditure is the second largest household spending category, next to housing.
- Annual household expenditures on transportation differ in dollar amount by

income quintile, with the highest income quintile spending on average 4.7 times as much (\$16,788) as the lowest income quintile (\$3,555). However, as a percent of

average annual total household expenditures transportation spending was similar across income quintiles.

Transportation Economics

The Nation's transportation system makes possible the efficient movement of both people and goods throughout the country and internationally. As discussed in chapter 1, transportation assets, totaling \$7.7 trillion in 2013, are a major underpinning of the Nation's wealth and prosperity. Besides facilitating activity in all segments of the economy, the for-hire transportation sector (services for which one pays a fee or buys

a ticket) directly employed over 4.6 million people in 2014, generating revenues from taxes and user fees through payments for fuel, and invested in infrastructure and equipment needed to move people and goods. Beyond its contribution to the U.S. gross domestic product (GDP), transportation is also an important element in both household and government budgets. The average household spends about \$9,000 per year on transportation, while the government spends about \$1,000 per capita on transportation expenditures.

TABLE 5-1 Gross Domestic Product (GDP) Attributed to Transportation-Related Final Demand: 2000, 2007–2014
Billions of chained 2009 dollars

	2000	2007	2008	2009	2010	2011	2012	2013	2014
Gross domestic product	\$12,559.7	\$14,873.7	\$14,830.4	\$14,418.7	\$14,783.8	\$15,020.6	\$15,354.6	\$15,583.3	\$15,961.7
Total transportation-related final demand	\$1,336.2	\$1,389.7	\$1,296.9	\$1,208.5	\$1,239.5	\$1,287.6	\$1,323.1	\$1,365.1	\$1,422.1
Total transportation in GDP (percent)	10.6%	9.3%	8.7%	8.4%	8.4%	8.6%	8.6%	8.8%	8.9%
Personal consumption of transportation, total	\$945.0	\$1,005.0	\$924.5	\$867.0	\$870.4	\$882.6	\$910.8	\$940.8	\$978.3
Motor vehicles and parts	\$346.4	\$392.8	\$340.8	\$317.1	\$323.4	\$333.8	\$359.1	\$375.8	\$396.7
Motor vehicle fuels, lubricants, and fluids	\$265.8	\$273.2	\$262.4	\$260.2	\$259.9	\$254.7	\$252.5	\$256.3	\$257.7
Transportation services	\$332.8	\$339.0	\$321.3	\$289.7	\$287.1	\$294.1	\$299.2	\$308.7	\$323.9
Gross private domestic investment, total	\$212.9	\$213.0	\$166.9	\$79.7	\$146.7	\$192.3	\$229.3	\$253.5	\$282.7
Transportation structures	\$8.8	\$9.4	\$10.0	\$9.1	\$9.8	\$9.3	\$10.4	\$10.4	\$10.9
Transportation equipment	\$204.1	\$203.6	\$156.9	\$70.6	\$136.9	\$183.0	\$218.9	\$243.1	\$271.8
Exports (+), total	\$217.0	\$269.5	\$268.7	\$218.7	\$247.5	\$273.3	\$295.8	\$312.3	\$323.5
Imports (-), total	\$321.7	\$386.5	\$350.6	\$254.0	\$323.0	\$349.6	\$389.9	\$410.6	\$435.4
Net exports of transportation-related goods and services	-\$104.7	-\$117.0	-\$81.9	-\$35.3	-\$75.5	-\$76.3	-\$94.1	-\$98.3	-\$111.9
Government transportation-related purchases, total	\$283.0	\$288.7	\$287.4	\$297.1	\$297.9	\$289.0	\$277.1	\$269.1	\$273.0
Federal purchases	\$25.3	\$32.6	\$35.3	\$35.9	\$37.8	\$38.6	\$38.9	\$36.2	\$36.1
State and local purchases	\$245.5	\$235.5	\$232.5	\$238.7	\$236.0	\$228.1	\$221.4	\$219.5	\$224.3
Defense-related purchases	\$12.2	\$20.6	\$19.6	\$22.5	\$24.1	\$22.3	\$16.8	\$13.4	\$12.6

NOTES: Total transportation-related final demand is the sum of total Personal consumption of transportation, total Gross private domestic investment, Net exports of transportation-related goods and services and total Government transportation-related purchases. Net exports is exports minus Imports of civilian aircraft, engines, and parts; automotive vehicles, engines, and parts; and transport. Federal purchases and State and local purchases are the sum of consumption expenditures and gross investment. Defense-related purchases are the sum of transportation of material and travel. The Bureau Economic Analysis has changed the reference year for chained dollar estimates from 1999 onward as part of the comprehensive revision of the national income and product accounts in 2014.

SOURCE: U.S. Department of Commerce, Bureau of Economic Analysis, National Income and Product Accounts Tables, tables 1.1.6, 2.3.6, 2.4.6, 3.11.6, 3.15.6, 4.2.6, 5.4.6, and 5.5.6, available at <http://www.bea.gov/National/nipaweb/SelectTable.asp?Selected=N> as of August 2015.

Transportation's Role and Contribution to the Economy

The demand for transportation included \$1,422 billion in personal consumption (e.g., vehicle and motor fuel purchases), private domestic investment in transportation structures and equipment, government purchases, and exports related to transportation goods and services in 2014 (as measured in chained 2009 dollars). Transportation, as a share of the Nation's total demand for goods and services, accounted for 8.9 percent of U.S. GDP in 2014 (table 5-1). GDP is an economic measure of all goods and services produced and consumed in the country.

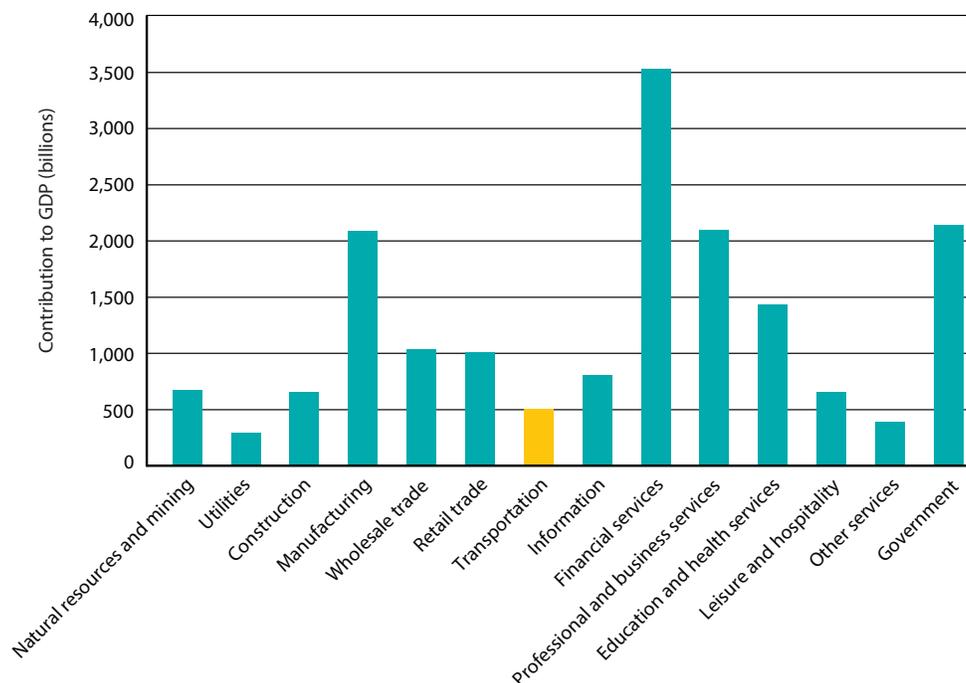
The contribution of transportation to the economy can also be found by looking at transportation's role in production. The transportation services used to move wheat from farms to mills, flour from mills to bakers, and bread from bakers to grocery stores, exemplifies how transportation enables the production and sale of nearly everything made and consumed in the United States. The U.S. Input-Output (I-O) accounts show the industries using transportation services provided by transportation firms on a fee basis, called for-hire transportation, and the contribution of for-hire transportation firms to the economy. In 2014 for-hire transportation contributed \$506.2 billion (2.9 percent) to U.S. GDP (current dollars). While for-hire transportation contributes less to the economy than other industries, for-hire transportation delivers the raw materials other industries need to produce finished products and delivers finished products to consumers (figure 5-1). The Transportation Satellite Accounts (TSAs),

produced by the Bureau of Transportation Statistics, expand on the I-O accounts to show the full role of transportation in production (see box 5-A). The TSAs use the same structure as the I-O accounts and quantify transportation's role and impact from four perspectives.

1. the value of transportation services each transportation industry *makes*,
2. the amount of transportation *used* by each industry and sector in the economy and the contribution of each industry and sector to the economy,
3. the amount of transportation *required* to produce one dollar of each product, and
4. the inputs *required* to produce one dollar of transportation.

The TSAs provide data for the years 2002 through 2012. In the 2012 TSAs, for-hire transportation contributed 2.9 percent to the U.S. GDP of \$16.5 trillion. Transportation services (air, rail, truck, and water) provided by nontransportation industries for their own use, called in-house transportation, contributed an additional 1.2 percent (\$203.2 billion) to U.S. GDP. The contribution of in-house truck transportation to GDP (\$172.1 billion) exceeded the contribution of for-hire truck transportation (\$123.0 billion) due to the extensive operation of trucks by nontransportation industries for their own purposes (figure 5-2).

Similarly, one can consider households as producers of transportation. Households produce transportation services by purchasing goods and services, such as cars and motor vehicle fuel, so they can travel by their own motor vehicle. The household production of

FIGURE 5-1 Industry Contribution to Gross Domestic Product: 2014

SOURCE: U.S. Department of Commerce, Bureau of Economic Analysis, National Income and Product Accounts, available at <http://bea.gov> as of September 2015.

Box 5-A Transportation Satellite Accounts

The Transportation Satellite Accounts (TSAs) belong to the group of satellite industry accounts that supplement national income and product accounts and input-output accounts by focusing on a particular aspect of economic activity. The TSAs seek to capture transportation services provided by both for-hire transportation industries and by nontransportation industries for their own use, and transportation by households through the use of personal vehicles.

For-hire transportation consists of the air, rail, truck, passenger and ground transportation, pipeline, and other support services (e.g., air traffic control) provided by transportation firms to industries and the public on a fee-basis, such

as railroads, transit agencies, common carrier trucking companies, and pipelines.

In-house transportation consists of air, rail, water, and truck services provided by businesses for their own use. Business in-house transportation includes privately owned and operated vehicles of all body types, used primarily on public rights of way, and the supportive services to store, maintain, and operate those vehicles. A baker's delivery truck is an example of business in-house transportation.

Household transportation covers transportation provided by households for their own use through the use of a motor vehicle. Air passenger travel is included in for-hire air transportation.

transportation services contributed \$295.6 billion (1.8 percent) to U.S. GDP in 2012 (figure 5-2).

Transportation indirectly contributes to the economy by enabling the production of goods and services. Some industries depend on transportation more than others. In 2012 the wholesale and retail trade industry depended the most on transportation, requiring 10.9 cents of transportation per dollar of output (figure 5-3).

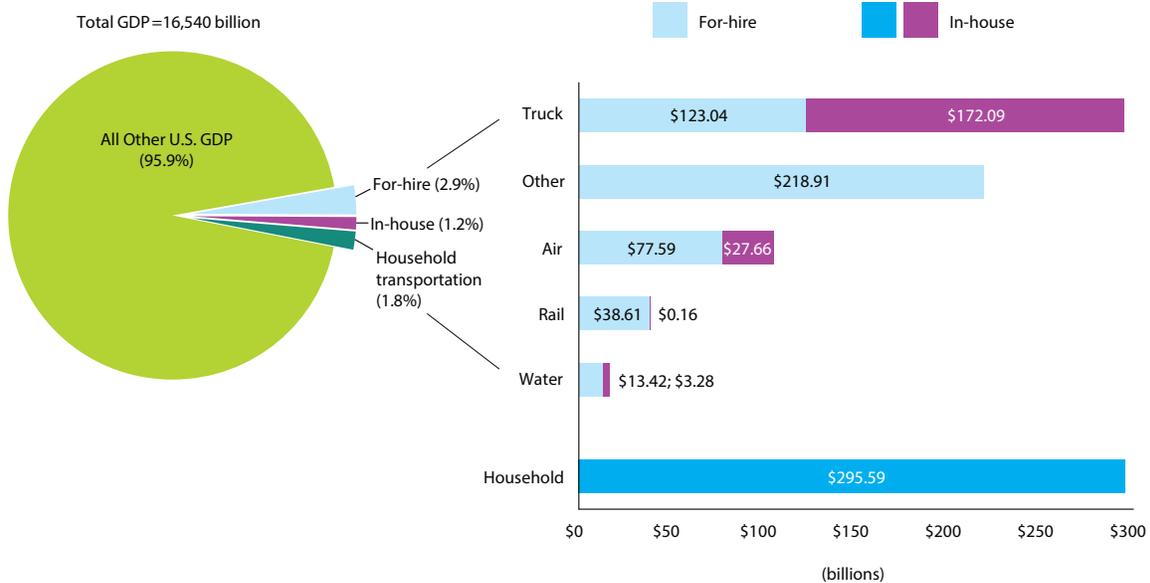
Transportation and Economic Cycles

Total spending on transportation fell in 2008 after the onset of the 2007–2009 economic recession and only as of 2014, returned to the

pre-recession level. While total spending on transportation in 2014 exceeds the 2007 level, data on transportation-related demand show that personal consumption of transportation (\$978.3 billion in 2014) has not reached the pre-recession level (\$1,005 billion in 2007) (table 5-1).

Data for 2014 freight traffic and passenger travel show the transportation related economic recovery. The Transportation Services Index (TSI), created by the Bureau of Transportation Statistics, combines available data on freight traffic and passenger travel to measure the movement of freight and passengers (see box 5-B). All freight traffic and passenger travel

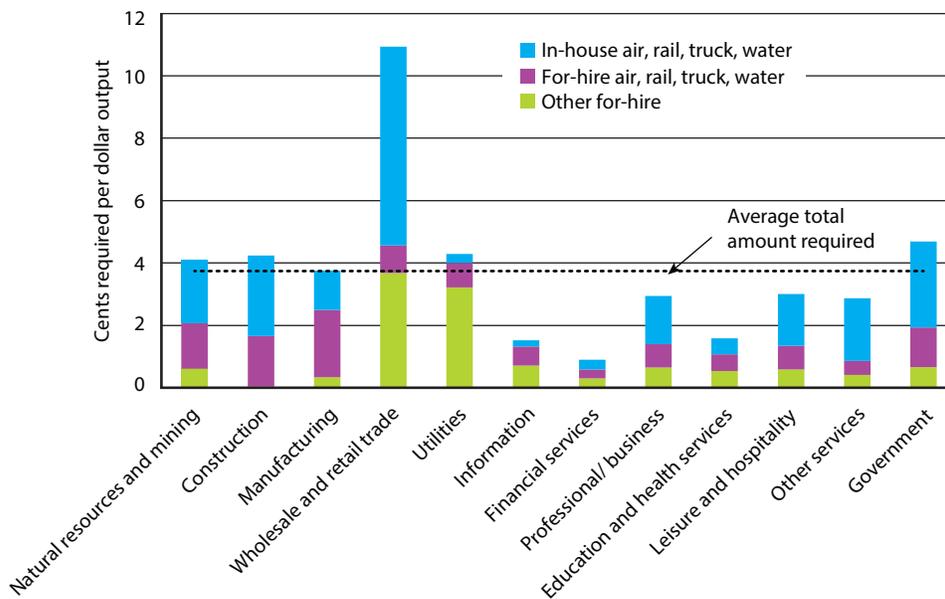
FIGURE 5-2 Value Added by Transportation Mode and Year (current dollars)



NOTES: In-house transportation consists of the services provided by non-transportation industries, including households, for their use. Business in-house transportation includes privately owned and operated vehicles of all body types, used primarily on public rights of way, and the supportive services to store, maintain, and operate those vehicles. Household transportation covers transportation provided by households for their own use through the use of an automobile. For-hire transportation consists of the services provided by transportation firms to industries and the public on a fee-basis. Other for-hire transportation includes: pipeline, transit and ground passenger transportation, including State and local government passenger transit; sightseeing transportation and transportation support; courier and messenger services; and warehousing and storage. Gross domestic product (GDP) increased from value reported by the Bureau of Economic Analysis in I-O use table by total output from the household production of transportation services.

SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics, Transportation Satellite Accounts, available at www.bts.gov, as of August 2015.

FIGURE 5-3 Transportation Required Per Dollar of Output by Sector: 2012



NOTES: In-house transportation consists of transportation services (air, rail, truck, and water) provided by nontransportation industries for their own use. For-hire transportation consists of the services provided by transportation firms to industries and the public on a fee-basis. Airlines, railroads, transit agencies, common carrier trucking companies, and pipelines are examples of for-hire transportation industries. "Other" for-hire transportation includes: Transit and passenger ground transportation (including State and local government passenger transit); Pipeline; Sightseeing transportation and transportation support; Courier and messenger services; Warehousing and storage; and Other transportation and support activities.

SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics, Transportation Satellite Accounts, available at <http://www.bts.gov> as of March 2015.

BOX 5-B Transportation Services Index (TSI)

The Transportation Services Index (TSI), produced by the U.S. Department of Transportation (DOT), Bureau of Transportation Statistics (BTS), measures the movement of freight and passengers. The index combines seasonally adjusted data on freight and passenger travel, which have been weighted to yield a monthly measure of transportation services output. The TSI is represented by three indexes: freight transportation services (freight TSI), passenger transportation services (passenger TSI), and total TSI (freight and passenger combined). The TSI freight index combines air revenue ton-miles, rail carloads, rail intermodal traffic, truck tonnage, tonnage carried on U.S. internal waterways, petroleum pipeline movement, and natural

gas consumption. The TSI passenger index combines air revenue passenger miles, rail passenger miles, and public transit ridership.

The TSI includes only domestic "for-hire" transportation operated on behalf of or by a company that provides freight or passenger transport services to external customers for a fee. Not included in the for-hire population is taxi and intercity bus services; in-house transportation, which includes vehicles owned by private firms providing services to that firm; and noncommercial passenger travel (e.g., trips in the family car). The for-hire transportation services component constitutes approximately 60 percent of total transportation services [USDOT BTS TSA 2015].

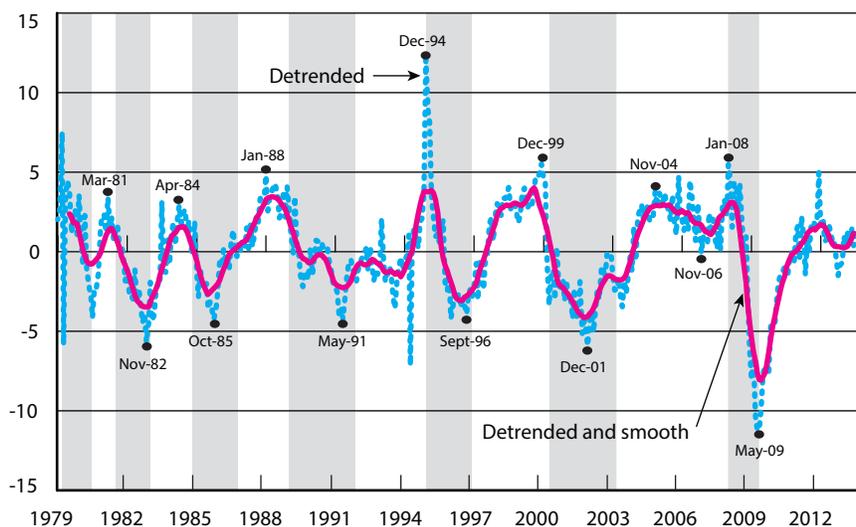
declined during the economic recession but have since rebounded, and the freight and passenger TSI reflects this recovery. The freight TSI reached a consistent monthly level above the January 2008 peak in the first quarter of 2013. The passenger TSI lagged the freight TSI recovery, reaching a consistent monthly level above the May 2007 peak in the second quarter of 2014 [USDOT BTS TSI 2014 2015]. The freight TSI and the passenger TSI peaked in different months because the two indices relate to different economic sectors. BTS has shown the freight TSI to be a leading economic indicator, turning about 4 months prior to accelerations and decelerations (growth cycles) in the economy (figure 5-4). The passenger TSI also moves in anticipation of changes in the

economy; however, it tends to lead periods of expansion or recession (business cycles) in the economy (figure 5-5) [USDOT BTS 2014a].

Transportation-Related Employment and Productivity

The transportation sector (transportation service providers and warehousing) is a significant employer in the United States. In 2014 about 4.6 million people worked in transportation services and warehousing, with trucking accounting for 30.5 percent of that total. The transportation and warehousing labor force declined during the 2007 to 2009 recession and continued to fall through 2010 before rising above the 2007 level in 2014 (table 5-2).

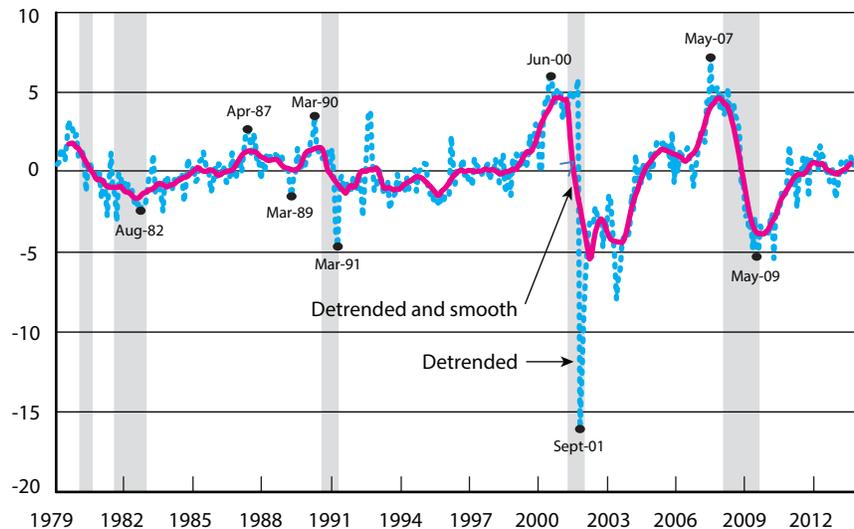
FIGURE 5-4 Detrended Freight TSI, Detrended and Smoothed Freight TSI and Growth Cycles: January 1979–December 2013



NOTES: Shaded areas indicate decelerations in the economy (growth cycles). Detrending and smoothing refer to a statistical procedure that makes it easier to observe changes in upturns and downturns of the data. Detrending removes the long term growth trend and smoothing eliminates month to month volatility.

SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics, *Transportation Services Index and the Economy Revisited*, December 2014, available at www.bts.gov as of December 2014.

FIGURE 5-5 Detrended Passenger TSI, Detrended and Smoothed Passenger TSI and Growth Cycles: January 1979–December 2013



NOTES: Shaded areas indicate economic recessions (business cycles). Detrending and smoothing refer to a statistical procedure that makes it easier to observe changes in upturns and downturns of the data. Detrending removes the long term growth trend and smoothing eliminates month to month volatility.

SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics, *Transportation Services Index and the Economy Revisited*, December 2014, available at www.bts.gov as of December 2014.

Employment in transportation is not limited to transportation service providers and warehousing. Many work in businesses with transportation-related functions, such as motor vehicle parts dealers and vehicle and equipment manufacturing. Including these workers brings the total employed in transportation to 12.3 million, or 8.8 percent of the U.S. labor force in 2014 (table 5-2).

Some workers are employed in nontransportation-related industries but hold transportation-related occupations. Truck drivers, for instance, may be employed by grocery chains that operate their own truck fleets. In 2014 there were 2.4 million people employed as truck drivers in the United States. More persons were employed as truck

drivers than in any other transportation-related occupation (table 5-3).

The range of annual wage levels for different transportation and transportation-related occupations is wide. For example, in 2014 air traffic controllers, airline pilots, and aerospace engineers had an annual median wage of more than \$100,000; while the largest transportation-related occupation, heavy and tractor-trailer truck drivers, had an annual median wage of \$39,520. The highest wage occupations employ relatively few workers while the lower wage occupations employ millions of workers (figure 5-6).

The size of the transportation workforce depends on the demand for transportation and on firms' utilization of the workforce.

TABLE 5-2 Employment in For-Hire Transportation and Select Transportation-Related Industries: 2000, 2007–2014 (thousands)

Industry	2000	2007	2008	2009	2010	2011	2012	2013	2014
TOTAL U.S. labor force	132,019	137,936	137,170	131,233	130,275	131,842	134,104	136,368	139,042
Transportation related labor force	13,915	13,504	13,210	12,238	12,097	12,324	12,583	12,794	12,251
Percent	10.5%	9.8%	9.6%	9.3%	9.3%	9.3%	9.4%	9.4%	8.8%
Transportation and warehousing	4,410	4,541	4,508	4,236	4,191	4,302	4,416	4,495	4,640
Air transportation	614	492	491	463	458	457	459	449	442
Rail transportation	232	234	231	218	216	228	231	232	235
Water transportation	56	66	67	63	62	61	64	66	67
Truck transportation	1,406	1,439	1,389	1,268	1,250	1,301	1,349	1,380	1,416
Transit and ground passenger transportation	372	412	423	422	430	440	440	446	465
Pipeline transportation	46	40	42	43	42	43	44	44	47
Scenic and sightseeing transportation	28	29	28	28	27	28	28	29	31
Support activities for transportation	537	584	592	549	543	562	580	594	625
Couriers and messengers	605	581	573	546	528	529	534	544	574
Warehousing and storage	514	665	672	637	633	653	687	712	738
Transportation related manufacturing^a	2,180	1,826	1,725	1,463	1,447	1,493	1,573	1,616	1,673
Petroleum and coal products manufacturing	123	115	117	115	114	112	112	111	111
Transportation equipment manufacturing	2,057	1,712	1,608	1,348	1,333	1,382	1,461	1,505	1,563
Other transportation related industries^a	2,783	2,770	2,674	2,463	2,449	2,522	2,581	2,657	2,742
Motor vehicle parts dealers	1,847	1,908	1,831	1,638	1,629	1,691	1,737	1,792	1,861
Gasoline stations	936	862	842	826	819	831	844	865	881
Postal service	880	769	747	703	659	631	611	595	593
Government employment, total	873	890	895	902	911	892	870	862	U
U.S. DOT	64	54	56	58	58	58	57	55	55
State and Local	809	835	839	845	853	834	813	807	U

^a Total is for the selected industries.

KEY: U = data are unavailable.

NOTES: Totals are annual averages. For-Hire Transportation and warehousing includes transportation equipment; petroleum products; tires; rubber; plastics; search, detection, navigation, guidance, aeronautical, and nautical systems; and instrument manufacturing. Fiscal year data. Government employment includes highway, air, transit, and water modes. Details may not add to totals due to independent rounding.

SOURCES: U.S. Department of Labor, Bureau of Labor Statistics Data; U.S. Census Bureau; and U.S. Department of Transportation, as cited in the U.S. Department of Transportation, Bureau of Transportation Statistics, *National Transportation Statistics*, table 3-23, available at <http://www.bts.gov> as of April 2015.

Technological improvements, more efficient utilization of employed persons, and other factors enable firms to produce transportation services with fewer employees.

Labor productivity measures the production of goods and services per hour of labor. From 2000 to 2014, air transportation's labor productivity rose the most among those transportation modes that collect labor

productivity data, increasing by 93 percent. Labor productivity for rail increased by about 32 percent during the same period. Smaller increases occurred in freight trucking (20 percent) and the U.S. Postal Service (2 percent) [USDOL BLS Industry Productivity 2015] (figure 5-7). Increases in labor productivity are the result of multiple factors, including a more efficient mix of labor and capital through technology growth, reductions in the

TABLE 5-3 Employment in Select Transportation and Transportation-Related Occupations: 2000, 2007–2014 (thousands)

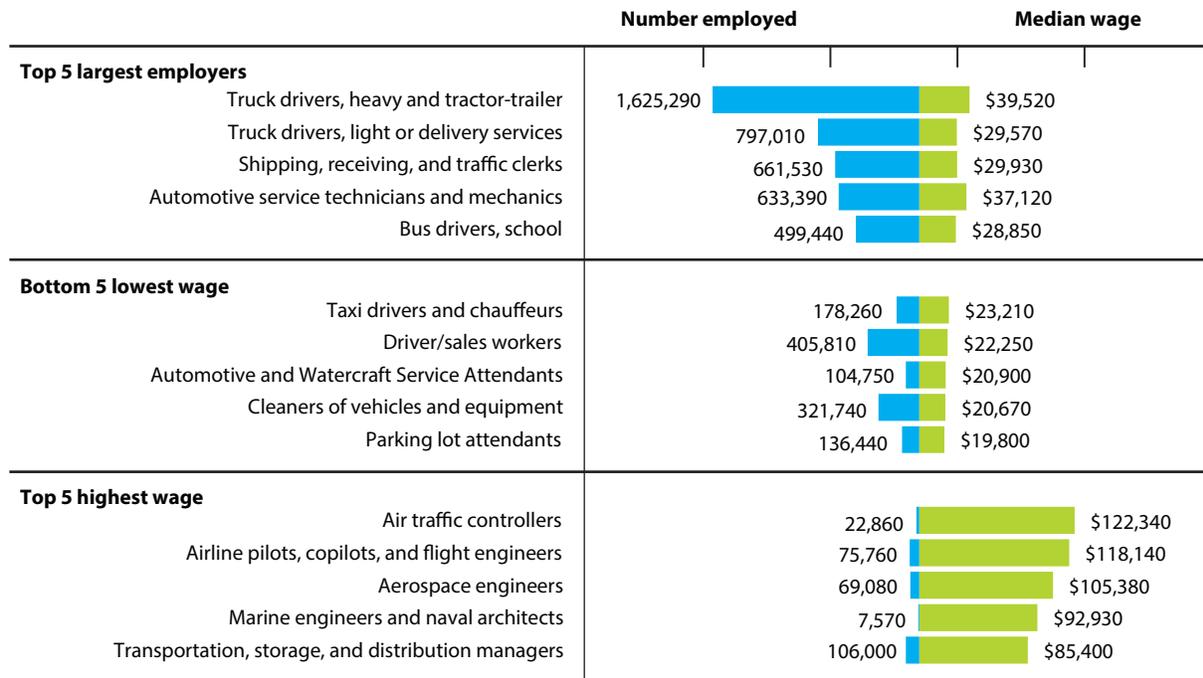
Occupation (SOC code)	2000	2007	2008	2009	2010	2011	2012	2013	2014
Vehicle operators, pipeline operators, and primary support^a	3,406	3,472	3,431	3,221	4,523	3,129	3,178	3,223	3,300
Airline pilots, copilots, and flight engineers (53-2011)	95	78	77	74	69	68	66	73	76
Air traffic controllers (53-2021)	23	24	24	24	24	24	23	23	23
Driver/sales workers (53-3031)	374	382	373	363	372	388	394	396	406
Truck drivers, heavy and tractor-trailer (53-3032)	1,577	1,694	1,673	1,551	1,467	1,509	1,557	1,585	1,625
Truck drivers, light or delivery services (53-3033)	1,033	923	909	835	780	771	769	777	797
Taxi drivers and chauffeurs (53-3041)	130	166	171	168	1612	167	167	170	178
Locomotive engineers (53-4011)	29	42	43	44	41	39	37	37	38
Rail yard engineers, dinkey operators, and hostlers (53-4013)	4	5	5	5	6	5	5	5	4
Railroad brake, signal, and switch operators (53-4021)	17	23	25	24	23	24	24	24	21
Railroad conductors and yardmasters (53-4031)	40	38	40	42	43	44	43	43	43
Sailors and marine oilers (53-5011)	30	33	32	32	32	31	32	29	28
Captains, mates, and pilots of water vessels (53-5021)	21	31	31	30	29	30	31	30	31
Ship engineers (53-5031)	7	14	11	11	9	10	11	10	10
Bridge and lock tenders (53-6011)	5	5	4	4	3	3	3	3	3
Gas compressor and gas pumping station operators (53-7071)	7	4	4	4	4	4	4	5	5
Pump operators, except wellhead pumpers (53-7072)	14	10	9	10	9	12	12	13	12
Transportation equipment manufacturing and maintenance occupations^a	754	795	759	708	700	719	748	761	767
Aerospace engineers (17-2011)	72	86	68	71	78	79	80	72	69
Marine engineers and naval architects (17-2121)	5	7	6	5	6	5	7	7	8
Bus and truck mechanics and diesel engine specialists (49-3031)	259	250	249	233	223	223	230	238	243
Rail car repairers (49-3043)	11	23	21	21	19	19	19	19	20
Automotive and Watercraft Service Attendants (53-6031)	106	93	84	79	86	102	109	113	105
Cleaners of vehicles and equipment (53-7061)	301	336	331	299	288	291	303	312	322
Transportation infrastructure construction and maintenance occupations^a	19	22	24	23	25	26	28	26	25
Rail-track laying and maintenance equipment operators (47-4061)	10	14	15	15	16	16	17	16	15
Signal and track switch repairers (49-9097)	6	6	7	6	7	8	9	8	8
Dredge operators (53-7031)	3	2	2	2	2	2	2	2	2
Secondary Support Service Occupations^a	1,548	1,465	1,482	1,405	1,353	1,347	1,344	1,336	1,331
Dispatchers, except police, fire, and ambulance (43-5032)	167	190	193	185	181	182	185	185	190
Parking lot attendants (53-6021)	117	132	136	130	125	126	127	130	136
Postal service mail carriers (43-5052)	355	348	355	339	325	315	305	307	307
Shipping, receiving, and traffic clerks (43-5071)	865	756	761	715	688	688	691	677	662
Transportation inspectors (53-6051)	27	24	25	24	24	25	24	24	24
Tank car, truck, and ship loaders (53-7121)	17	15	12	12	10	11	12	13	12
Other^a	117	93	96	92	90	92	99	103	106
Transportation, storage, and distribution managers (11-3071)	117	93	96	92	90	92	99	103	106

^a Total is for the selected occupations.

KEY: SOC = Standard Occupational Classification.

SOURCES: Transportation and transportation-related occupations from U.S. Department of Transportation, Bureau of Transportation Statistics, *National Transportation Statistics*, Table 3-24, available at www.bts.gov; Data from U.S. Department of Labor, Bureau of Labor Statistics, *Occupational Employment and Wages*, available at <http://www.bls.gov/oes> as of April 2015.

FIGURE 5-6 Employment and Wages in Select Transportation and Transportation-Related Occupations: 2014



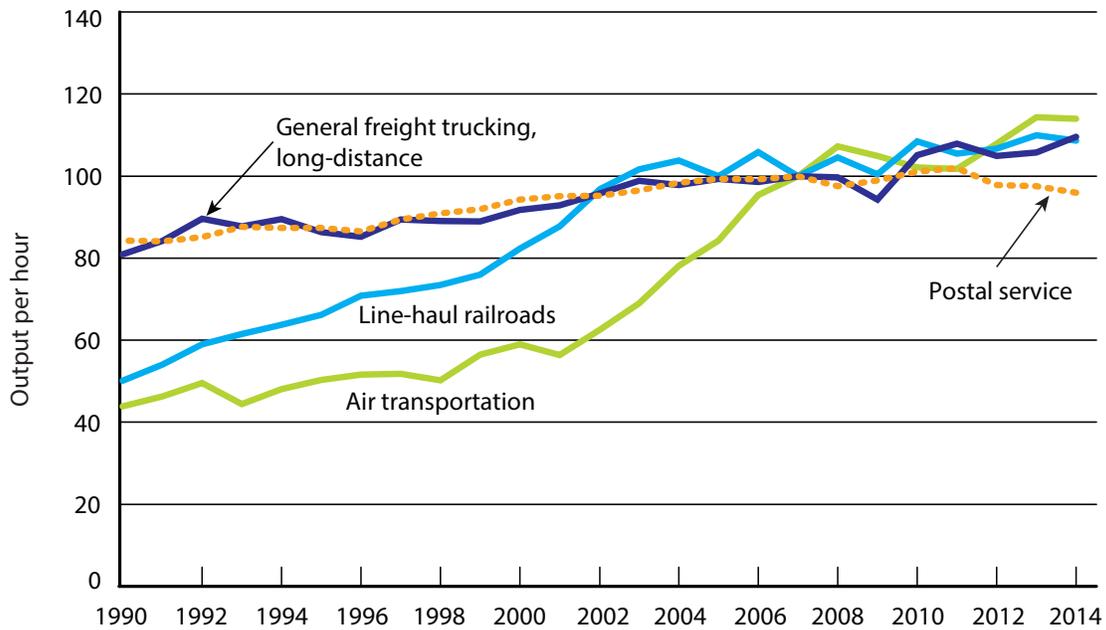
KEY: SOC = Standard Occupational Classification.

NOTE: Transportation and transportation-related occupations from U.S. Department of Transportation, Bureau of Transportation Statistics, National Transportation Statistics, Table 3-24, available at www.bts.gov.

SOURCE: U.S. Department of Labor, Bureau of Labor Statistics, Occupational Employment and Wages, available at <http://www.bls.gov/oes> as of April 2015.



FIGURE 5-7 Labor Productivity Indices for Selected Transportation Industries: 1990–2014



NOTE: Data in this table are not comparable to the data published in previous editions due to change in base year from 2002 to 2007.

SOURCE: U.S. Department of Labor, Bureau of Labor Statistics, Industry Productivity and Costs, available at <http://www.bls.gov/lpc/> as of November 2015

workforce or wages following a recession, and changes in regulations among other potential market forces impacting the alignment between labor and output.

The impact of productivity on transportation companies can be seen through changes in revenue per ton-mile, which is the output of freight transportation modes, and revenue per passenger-mile, which is the output of passenger transportation modes, over time. The increase in labor productivity from 2000 to 2013 corresponds with an increase in revenue per unit of output from 2000 to 2013, exceeding the rate of inflation across air (passenger and freight) and rail (passenger and freight)—the modes for which revenue per unit of output data are available. The only

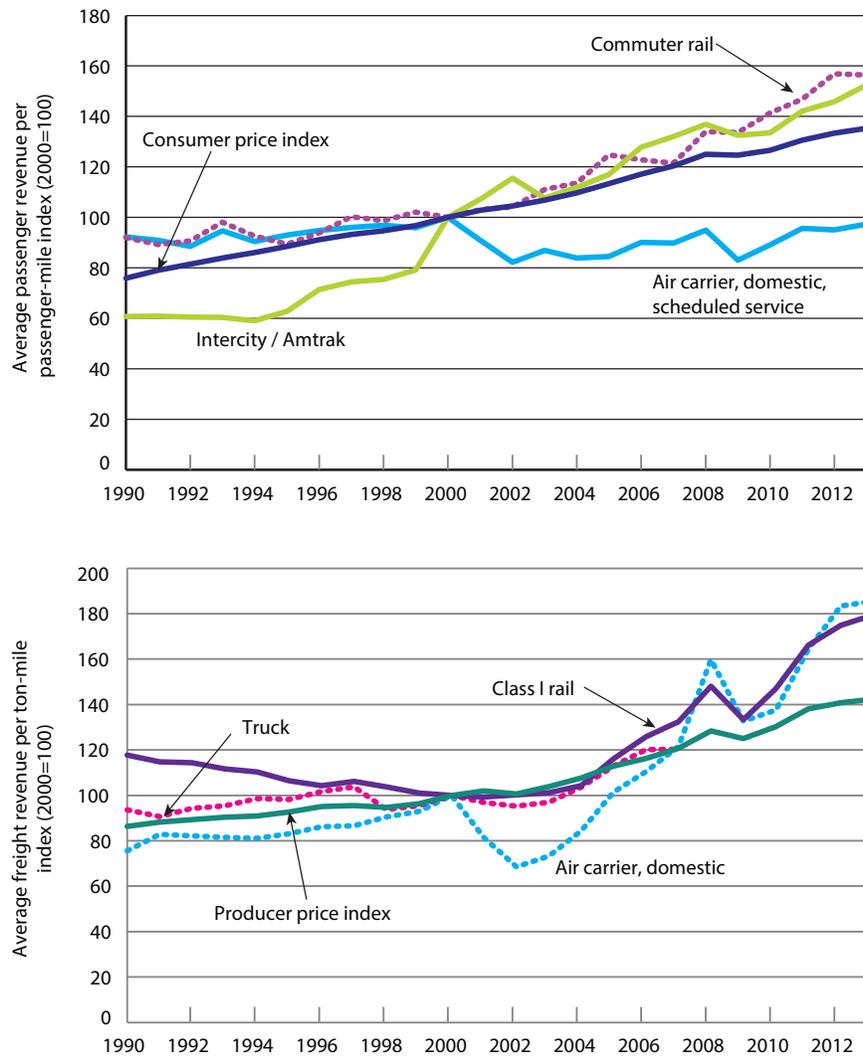
mode not showing an increase in revenue per unit of output between 2000 and 2013 is domestic passenger air travel, which fell after the 9/11 terrorists attacks and has not yet fully recovered, and general freight truck transportation, which grew marginally less than the rate of inflation between 2000 and 2007 (the latest year for which data are available) (figure 5-8).

Transportation Expenditures

Personal Consumption and Household Expenditures

Personal consumption expenditure data and household expenditure survey data provide two ways of looking at spending on transportation.

FIGURE 5-8 Revenue Per Unit of Output for Passenger and Freight Transportation Modes: 1990–2013



SOURCES: **Air carrier, domestic, scheduled service (passenger):** U.S. Department of Transportation, Bureau of Transportation Statistics, Office of Airline Information, *TranStats Database, T1: U.S. Air Carrier Traffic and Capacity Summary by Service Class*, available at http://www.transtats.bts.gov/DL_SelectFields.asp?Table_ID=264&DB_Short_Name=Air%20Carrier%20Summary as of Aug. 31, 2015 and *Air Carrier Financial Reports, Schedule P-1.2*, available at http://www.transtats.bts.gov/databases.asp?Mode_ID=1&Mode_Desc=Aviation&Subject_ID2=0 as of Aug. 31, 2015. **Commuter rail:** 1990-2001: American Public Transportation Association, *2011 Public Transportation Fact Book* (Washington, DC: 2011), tables 2 and 42 (passenger fares / passenger miles). 2002-13: U.S. Department of Transportation, Federal Transit Administration, National Transit Database, *Data Tables 19 and 26* (Washington, D.C.: Annual reports), available at <http://www.ntdprogram.gov/ntdprogram/data.htm> as of Aug. 31, 2015. **Intercity / Amtrak:** 1990-2002: National Passenger Rail Corporation (Amtrak), *Amtrak Annual Report, Statistical Appendix* (Washington, DC: Annual Issues) (transportation revenues / passenger-miles). 2003-13: Association of American Railroads, *Railroad Facts* (Washington, DC: Annual Issues), p. 77 and similar pages in previous editions (passenger revenue/revenue passenger miles). **Consumer Price Index:** U.S. Department of Labor, Bureau of Labor Statistics, *Consumer Price Index-Urban, U.S. All Items Indexes*, available at <http://www.bls.gov/cpi/> as of Aug. 31, 2015. **Air carrier, domestic, scheduled service (freight):** U.S. Department of Transportation, Bureau of Transportation Statistics, *TranStats Database, T-1, Schedule P-11, and Schedule P-12 data*, available at <http://www.transtats.bts.gov/> as of Sep. 1, 2015, special tabulation. **Truck:** 1990-2003: Eno Transportation Foundation, Inc., *Transportation in America* (Washington, DC: 2007), p. 46. 2004-07: U.S. Department of Commerce, U.S. Census Bureau, *2009 Transportation Annual Survey* (Washington, DC: January 2011), table 2.1, available at <http://www.census.gov/services/> as of Aug. 9, 2011, special tabulation. **Class I rail:** Association of American Railroads, *Railroad Facts* (Washington, DC: Annual Issues), p. 34 and similar pages in previous editions. **Producer Price Index:** U.S. Department of Labor, Bureau of Labor Statistics, *Producer Price Index-Commodities*, available at <http://www.bls.gov/ppi/> as of Sept. 1, 2015.

Personal consumption expenditures measure transportation consumption – what households spend, in aggregate, on transportation (e.g., expenditures on vehicles, fuel, etc.) and what federal, state, and local governments and other organizations spend on transportation on behalf of households (e.g., transportation subsidies that benefit households). Household expenditure data, on the other hand, capture only the purchases that households make themselves and show the average amount spent by a household.

Personal consumption data provide a picture of all goods and services purchased in the economy by households and by organizations on behalf of households (e.g., employer paid parking and transportation subsidies and health insurance and medical care financed by government programs) [USDOC BEA 2014]. In 2014 expenditures on transportation by U.S. residents were roughly \$1,231 billion. This translates to almost 10.4 percent of all personal consumption expenditures (figure 5-9).

Household expenditure survey data show that households spent an average of \$9,073 per year on transportation in 2014—roughly 17.0 percent of all expenditures. Average household expenditure is dollars directly paid by households and shows transportation as a larger percent compared to the personal consumption expenditure measure. Personal consumption expenditure account’s inclusion of health care payments—a payment largely made on behalf of households—results in health care becoming a significantly larger expenditure compared to transportation (figure 5-10).

The majority of household expenditures on transportation went to the purchase and upkeep of vehicles, including the cost of gasoline, according to both personal consumption expenditure data and household expenditure survey data.

Spending on transportation changes as income rises. Households in the highest income quintile spend on average 4.7 times as much on transportation annually (\$16,788) as households in the lowest income quintile (\$3,555). The difference in transportation spending results, in part, from a difference in the number of vehicles and earners per household. The average number of household vehicles rises with income (table 5-4).

Household expenditures on transportation rise by income quintile, but households across income quintiles spend a nearly equal percent of their budget on transportation (table 5-4).

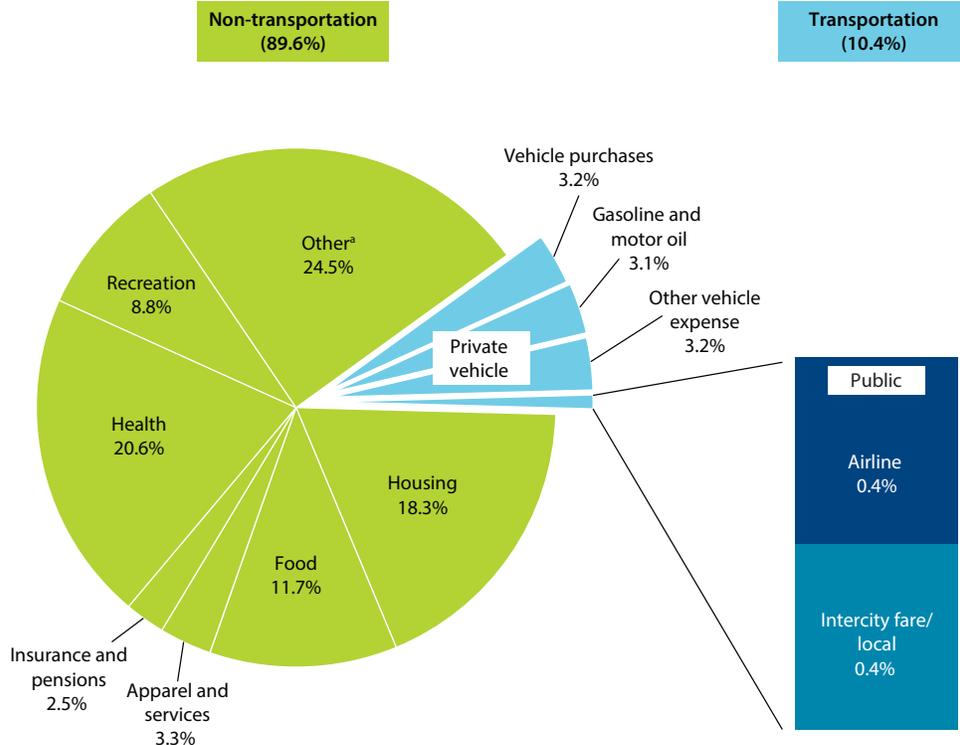
Public and Private Sector Revenue and Expenditures

Expenditures

Federal, state, and local governments spent approximately 5.1 percent (\$319.8 billion) of their expenditures on transportation in 2012¹ [USDOT BTS 2014b]. Federal, state, and local governments spent \$5.4 billion more in 2012 than 2011 but spent the same percent of their expenditures on transportation in both years. On a per capita basis, government spending on transportation averaged about \$1,000 per year [USDOT BTS 2014b]. The

¹ 2012 is the latest year for which comprehensive data have been published.

FIGURE 5-9 Personal Expenditures by Category: 2014

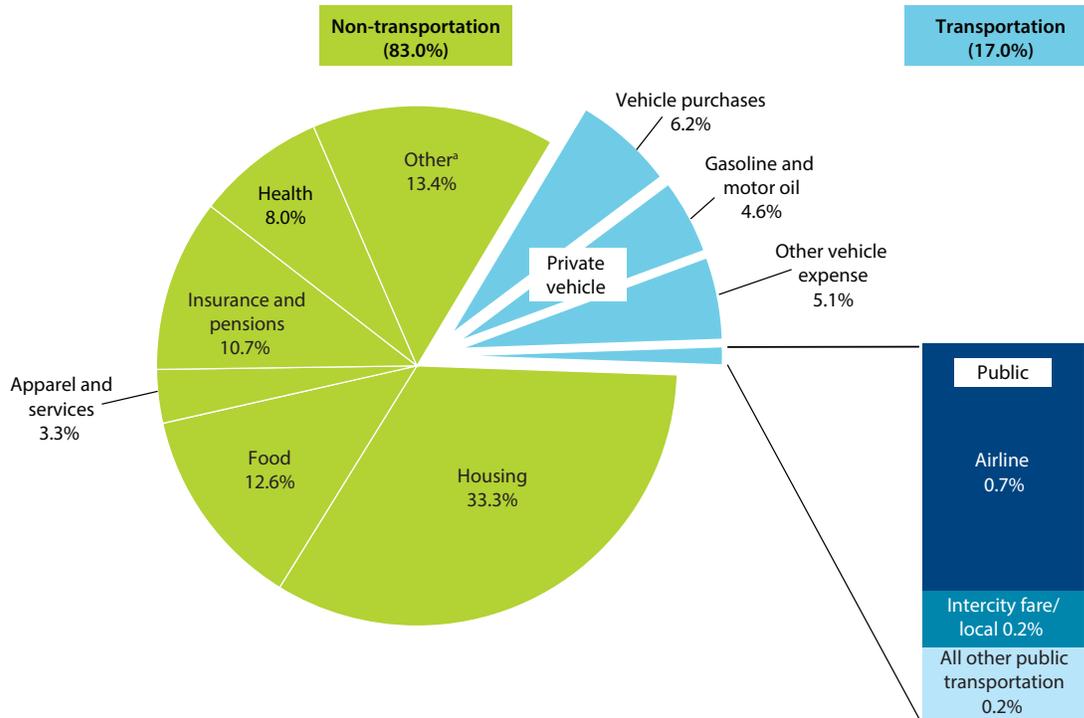


NOTES: Other includes: alcoholic beverages purchased for off-premises consumption; furnishings, household equipment, and routine household maintenance; education; accommodations; financial services (excluding pension funds); other goods and services; et foreign travel and expenditures abroad by U.S. residents; and final consumption expenditures of nonprofit institutions serving households Motor vehicle insurance included in other vehicle purchases.

SOURCE: U.S. Department of Commerce, Bureau of Economic Analysis, National Income and Product Accounts Tables, table 2.5.5, 2.4.5U, available at http://www.bea.gov/iTable/index_nipa.cfm as of November 2015.



FIGURE 5-10 Average Household Expenditures by Major Spending Category: 2014



Other includes alcoholic beverages, cash contributions, education, entertainment, personal care products and services, reading, tobacco products and smoking supplies, and other items.

SOURCES: U.S. Department of Labor, Bureau of Labor Statistics, *Consumer Expenditure Survey* tables, available at www.bls.gov/cex as of November 2015. Public transportation detail from microdata.

TABLE 5-4 Average Household Expenditures by Income Quintile and Selected Characteristics: 2014

Income quintiles	Avg. annual spending	Earners	Vehicles	Transportation expenditures	
				Total	% of avg. annual spending
All	53,495	1.3	1.9	9,073	17.0
\$17,833 and below	23,713	0.5	0.9	3,555	15.0
\$17,834 – \$34,958	33,546	0.8	1.4	5,696	17.0
\$34,959 – \$57,968	45,395	1.3	1.9	8,475	18.7
\$34,969 – \$95,336	60,417	1.7	2.3	10,844	17.9
\$95,337 and above	104,363	2.1	2.8	16,788	16.1

SOURCE: U.S. Department of Labor, Bureau of Labor Statistics, *Consumer Expenditure Survey*, available at www.bls.gov/cex as of November 2015.

expenditures covered, among other things, the monies needed to build, operate, and maintain publically owned transportation facilities and implement public policy in areas such as safety and security.

In 2012 state and local governments spent 88 percent of the \$319.8 billion (including Federal grant monies) in government transportation spending (table 5-5). Government transportation expenditures increased (without

adjusting for inflation) by 71.6 percent between 2000 and 2012. Nearly two-thirds of government expenditures went to highways, followed by transit (17.2 percent), air (13.1 percent), and water (4.1 percent) [USDOT BTS 2014b].

The public sector is the major funding source for transportation infrastructure construction, especially for streets and highways. In 2014 the value of government-funded (public)

TABLE 5-5 Government Transportation Expenditures: 2000, 2007–2012

Millions of current dollars

	2000	2007	2008	2009	2010	2011	2012
All modes, total	186,420	275,256	294,048	310,837	317,316	314,377	319,817
Federal	21,330	33,637	37,547	40,363	45,839	43,744	38,467
State and local	165,090	241,619	256,501	270,474	271,476	270,633	281,350
Highway, total	119,910	175,514	182,914	193,024	203,561	203,088	206,251
Federal	2,190	2,990	4,293	6,094	15,790	13,289	8,746
State and local	117,720	172,524	178,622	186,930	187,771	189,799	197,505
Transit, total	35,362	46,065	51,741	54,820	54,193	52,991	55,150
Federal	4,335	97	89	91	96	98	98
State and local	31,027	45,968	51,652	54,729	54,097	52,893	55,052
Rail, total	772	1,498	1,473	1,809	2,627	2,107	1,752
Federal	759	1,493	1,472	1,809	2,627	2,107	1,752
State and local	13	5	1	0	0	0	0
Air, total	22,332	39,466	44,564	45,875	42,774	41,425	41,794
Federal	9,172	21,134	23,287	23,125	18,558	18,706	18,217
State and local	13,160	18,332	21,277	22,750	24,216	22,719	23,577
Water, total	7,278	11,351	11,989	13,758	13,151	13,677	13,261
Federal	4,138	6,593	7,075	7,744	7,810	8,509	8,092
State and local	3,141	4,758	4,914	6,015	5,341	5,169	5,169
Pipeline, total	64	76	73	82	95	98	86
Federal	51	57	50	47	65	66	61
State and local	13	19	23	35	30	32	25
General Support, total	701	1,287	1,293	1,469	915	990	1,523
Federal	685	1,274	1,281	1,453	893	969	1,501
State and local	16	13	12	16	22	21	22

NOTES: Federal expenditures include direct Federal spending, excluding grants to state and local governments. State and local expenditures include outlays from all sources of funds, including federal grants, except rail and pipeline modes. Rail and pipeline modes include outlays funded by Federal grants only. The part of expenditures that may be funded by other state and local government funding sources are not covered due to a lack of data. Outlays for U.S. Army Corps of Engineers' civilian transportation-related activities, such as construction, operation, and maintenance of channels, harbors, locks and dams, are not included.

SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics, *Government Transportation Financial Statistics 2014*. Available at http://www.rita.dot.gov/bts/sites/rita.dot.gov/bts/files/publications/government_transportation_financial_statistics/index.html as of April 2015.

construction underway was about \$113.7 billion and accounted for 90 percent of spending on transportation infrastructure construction [USDOC CENSUS 2014]. Approximately three-quarters of government-funded investment was for highways; the remainder supported the construction of transportation facilities and infrastructure such as airport terminals and runways, transit facilities, water transportation facilities, and pedestrian and bicycling infrastructure (figure 5-11). Investment has been growing since 2012. These increases follow a decline in 2011 as the investment associated with the *American Recovery and Reinvestment Act* (Pub. L. 111-5) came to an end.

Private sector spending also has grown since declining in 2011. In 2014 the value put in place by private construction of transportation

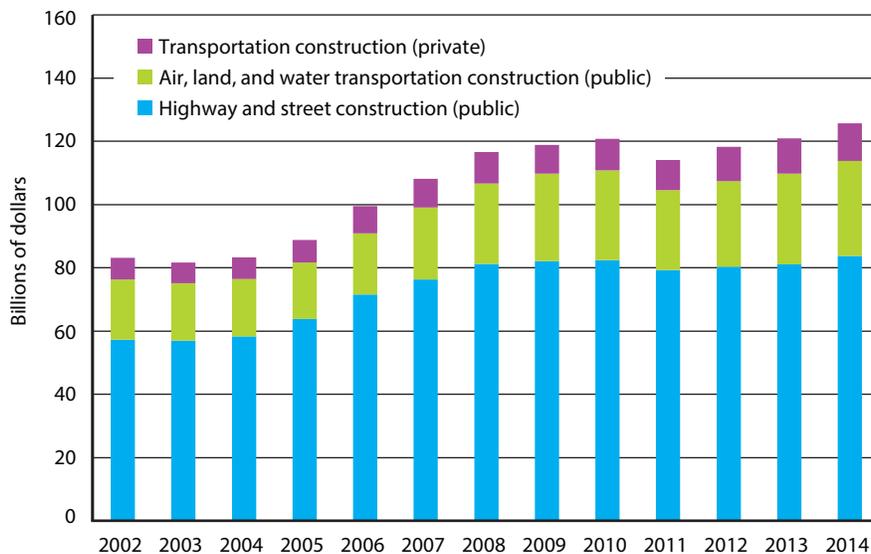
facilities and infrastructure was \$11.9 billion [USDOC CENSUS 2014]. Together, government-funded (public) and private investment in transportation construction totaled \$125.7 billion in 2014 (figure 5-11).

Revenue

Government transportation revenue comes from user taxes and fees, such as gasoline taxes and tolls, air ticket taxes and fees, and general revenues. In 2012² government transportation revenues from all sources totaled \$180.² billion (current dollars) (table 5-6). State and local governments collected 69.2 percent of all transportation-related revenue, while the Federal Government collected the remaining 30.8 percent. The highway sector generated the greatest revenues (mainly from gas taxes),

² 2012 is the latest year for which data are available.

FIGURE 5-11 Value of Transportation Infrastructure Construction Put in Place (current dollars)



SOURCE: U.S. Department of Commerce, Census Bureau, Value of Construction Put in Place, Not Seasonally Adjusted (2002-2014), available at <http://www.census.gov/> as of April 2015.

TABLE 5-6 Government Transportation Revenues: 2000, 2007–2012

Millions of current dollars

	2000	2007	2008	2009	2010	2011	2012
All modes, total	127,545	164,888	164,396	158,587	161,782	172,674	180,175
Federal	46,764	54,971	53,276	48,190	48,554	51,660	55,475
State and local	80,781	109,917	111,120	110,397	113,227	121,014	124,699
Highway, total	90,895	115,443	112,637	109,398	111,614	118,598	125,026
Federal ^a	34,986	40,652	38,458	35,144	35,026	36,955	40,265
State and local	55,910	74,791	74,179	74,254	76,588	81,642	84,761
Transit, total^e	10,670	13,868	14,586	15,288	15,328	17,234	17,607
Railroad, total ^d	1	0	0	0	0	0	0
Air, total ^b	22,243	29,580	30,895	27,931	28,427	29,968	31,103
Federal	10,548	12,187	12,672	11,109	10,995	12,003	12,796
State and local	11,695	17,393	18,223	16,822	17,432	17,965	18,307
Water, total	3,680	5,920	6,202	5,871	6,293	6,760	6,317
Federal	1,173	2,056	2,069	1,839	2,414	2,587	2,293
State and local	2,507	3,864	4,133	4,032	3,879	4,173	4,024
Pipeline, total ^{c,d}	30	60	63	78	90	90	90
General support, total^d	26	16	14	20	29	25	31

^a Includes both Highway and Transit Accounts of the Highway Trust Fund (HTF) and other receipts from motor fuel and motor vehicle taxes not deposited to the HTF. ^b Receipts from aviation user and aviation security fees also included. ^c Includes Harbor Maintenance Trust Fund, St. Lawrence Seaway tolls, Inland Waterway Trust Fund, Panama Canal receipts through 2000, Oil Spill Liability Trust Fund, Offshore Oil Pollution Fund, Deep Water Port Liability Fund, and excise taxes of the Boat Safety Program. ^d Includes Federal only. ^e Includes state and local government only.

NOTES: Government transportation revenue consists of money collected by governments from transportation user charges and taxes to finance transportation program. The revenue of a transportation mode includes all transportation revenues designated to that mode regardless of the sources or instruments from which the revenues are collected. Tolls from highways, bridges, and tunnels, etc., designated for transit use are counted as transit revenue.

SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics, Government Transportation Financial Statistics 2014. Available at http://www.rita.dot.gov/bts/sites/rita.dot.gov/bts/files/publications/government_transportation_financial_statistics/index.html as of April 2015.

accounting for \$125.0 billion (69.4 percent) of all revenue, followed by air with \$31.1 billion (17.3 percent) mainly from air ticket taxes and fees (table 5-6).

Total transportation revenues fell short of government transportation expenditures in 2012. In 2012 transportation revenues covered 56.3 percent of expenditures. The gap between transportation expenditures and revenues has declined since 2009, when revenues covered 51.0 percent of expenditures [USDOT BTS 2014b]. When revenues do not cover expenditures, general tax receipts (e.g., from sales and property taxes), trust fund balances, and borrowing are needed to cover the shortages.

Costs of Transportation

The movement of goods and people requires the use of resources—labor, equipment, fuel, and infrastructure. The use of these resources is the cost of transportation. Producers and users of transportation services pay for the resources. Users of transportation services include both businesses and households. Businesses pay for transportation to acquire inputs for the goods they make and to deliver final products to consumers. Households purchase resources, such as motor vehicles and motor vehicle fuel, for travel by automobile.

Costs Faced by Producers of Transportation Services

The major inputs to produce transportation goods and services include transportation equipment, fuel, labor, and other materials and supplies, as well as the depreciation of items like airplanes, trucks, railroad locomotives and freight cars, trucking terminals, railroad track, and other infrastructure. The price of these inputs impacts the price of freight and passenger transportation.

The price of transportation equipment has steadily increased since 2004, according to the Bureau of Labor Statistics' Producer Price Index (PPI). Transportation equipment PPI is an index that represents the average change in the price producers' receive for the goods and services they sell. The PPI reflects changes in transportation equipment prices faced by transportation service providers³. The average change in prices transportation service providers face when purchasing railroad rolling stock, aircraft, and ship and boat manufacturing, has grown more quickly than for all transportation equipment manufacturing (figure 5-12). Price increases may impact the profitability and decision making of the rail, air, and water transportation sector, lead to greater transportation costs for consumers using one of these modes, and influence prices in other sectors that rely on rail, air, and water transportation, such as wholesale, retail, and warehousing and storage. Similar impacts may be seen among transportation modes and sectors using automobiles. The prices faced by transportation service providers in purchasing

³ The actual prices transportation service providers pay may differ from the prices sellers receive for the transportation equipment they sell because of government subsidies, sales and excise taxes, and distribution costs.

automobiles rose in 2012, having remained steady for several years (figure 5-12).

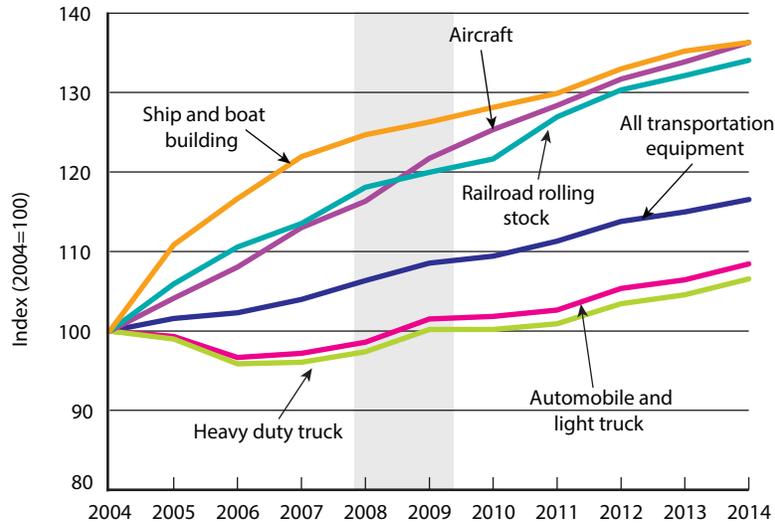
Transportation fuel prices also impact the price of freight and passenger transportation and the demand for transportation. An increase in fuel prices, for instance, may reduce the demand for transportation modes reliant on that fuel and shift demand to transportation modes that use less costly fuels. Average annual fuel prices for all classes of transportation fuels peaked in 2012 and have since declined (figure 5-13). In 2012 the average annual fuel price for gasoline was \$3.70, while the average annual fuel price for diesel fuel was \$3.20. In September 2015 the average fuel price for gasoline (all types) was \$2.75, while the average fuel price for diesel was \$2.02 [USDOE EIA 2015].

Costs Faced by Businesses

The prices that transportation companies charge for transportation impact the freight shippers' and travelers' transportation decisions (see box 2-A). The relative level and changes to transportation prices faced by businesses is captured in the PPI for transportation services.

The rail transportation PPI grew more rapidly (64.5 percent) than the PPI for any other transportation mode between 2004 and 2014. The relative prices for air and water transportation services also increased during this time period, with prices for trucking services growing at a slightly slower rate (30.8 percent) than air (42.0 percent) and water (36.7 percent) (figure 5-14). Across all modes, transportation prices faced by businesses halted their increasing trend in 2008, at the end of a period of economic growth and rising fuel prices. The cost of transportation services declined during the 2008–2009

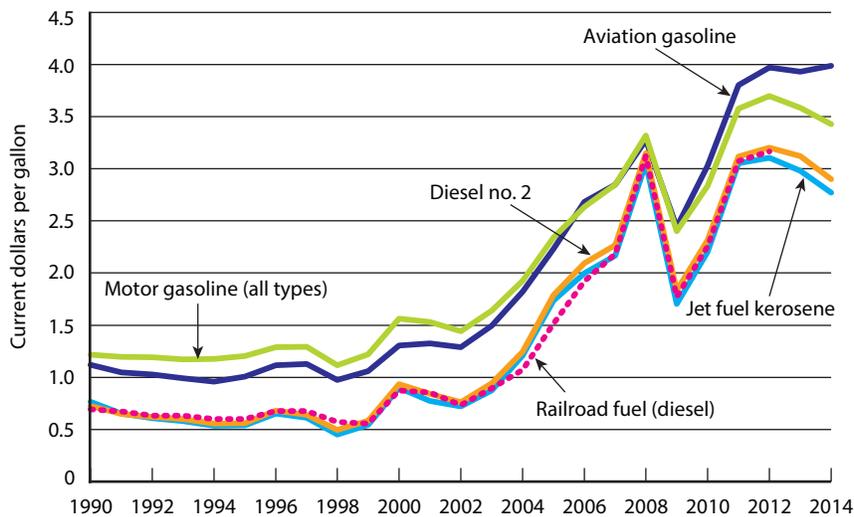
FIGURE 5-12 Average Change in Prices Faced by Transportation Providers in Purchasing Transportation Equipment



NOTE: Annual averages. Rebased to 2004. Shaded areas indicate economic recessions.

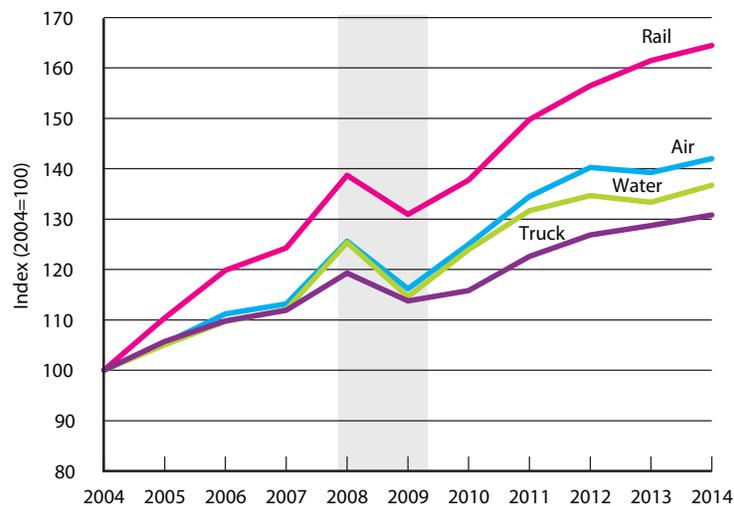
SOURCE: U.S. Department of Labor, Bureau of Labor Statistics, Producer Price Index Industry Data, available at <http://www.bls.gov/data/#productivity> as of April 2015.

FIGURE 5-13 Sales Price of Transportation Fuel to End-Users (dollars / gallon): 1990–2013



NOTE: Railroad fuel data through 2012.

SOURCES: All data except railroad fuel: U.S. Department of Energy, Energy Information Administration, *Monthly Energy Review* (Washington, DC: October 2015), tables 9.4 and 9.7, available at <http://www.eia.doe.gov/emeu/mer/prices.html> as of November 2015. Railroad fuel: Association of American Railroads, *Railroad Facts* (Washington, DC: Annual Issues), p. 61.

FIGURE 5-14 Average Changes to Transportation Prices Faced by Businesses

NOTE: Annual averages. Rebased to 2004. Shaded areas indicate economic recessions.

SOURCE: U.S. Department of Labor, Bureau of Labor Statistics, Producer Price Index Industry Data, available at <http://www.bls.gov/data/#productivity> as of April 2015.

economic recession but has since climbed steadily (figure 5-14).

Costs Faced by Households

The costs households face for transportation services (e.g., air travel) and transportation inputs (e.g., motor vehicle fuel) impact household spending decisions. Most passenger travel in the United States is by personal motor vehicle. The cost of owning and operating personal motor vehicles impacts household travel behavior—what mode households choose, how often they travel, and how far.

The cost of owning and operating a personal motor vehicle includes insurance, license, registration, taxes, depreciation, and finance charges (ownership costs) as well as gas, tires, and maintenance (operating costs). Fuel accounts for less than a quarter of the total annual cost of owning and operating a personal

motor vehicle on a cents-per-mile basis. In 1990 fuel accounted for 16.4 percent of the total cost of owning and operating a personal motor vehicle; in 2013 fuel accounted for 22 percent of these costs (figure 5-15).

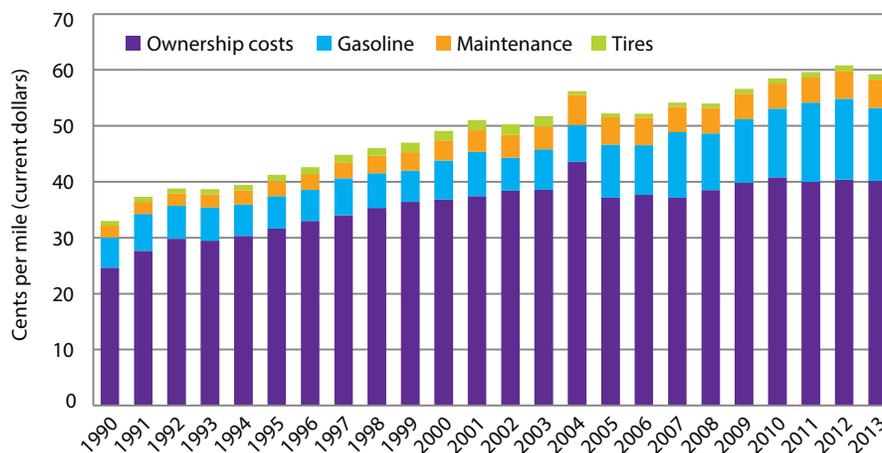
Household transportation costs grew by 62.6 percent from 2000 to 2014, according to the Consumer Price Index for Urban Consumers (CPI-U). Transportation costs fell in 2009 and marginally in 2014. [USDOL BLS CPI-U 2015].

International Trade: An Economic Impact of Transportation

Transportation and Trade

Transportation enables the export of American goods and services and connects U.S. businesses to sources of raw materials. An efficient and reliable domestic transportation

FIGURE 5-15 Average Cost of Owning and Operating an Automobile^a (assuming 15,000 vehicle-miles per year): 1990–2013



SOURCE: American Automobile Association, *Your Driving Costs* (Heathrow, FL: Annual Issues), available at <http://www.aaapublicaffairs.com> as of September 2014.

system with good connection to the international transportation system supports the United States in the global market place.

In the global marketplace, the transportation industry moves goods and provides services. Looking at only goods, the value of goods traded (including exports and imports) was \$3.5 trillion in 2014 (current dollars). After accounting for inflation, the real value of goods traded grew from 2000 to 2014, despite a slight decline during the 2008–2009 recession. Exports in goods drove growth in 2011 through 2014, but annual imports in goods continue to exceed exports. In 2014 the goods deficit (exports minus imports) was \$771 billion in current dollars [USDOC BEA NIPA 2015].

Of the goods traded in 2014, 16.7 percent were related directly to transportation.⁴ Petroleum

products, including fuel oil, comprised an additional 12.8 percent of all goods traded in 2014 [USDOC BEA ITA 2015].

The transportation industry also provides transportation services, such as sea and air transport, in the global marketplace. The value of transportation services traded (exports and imports) was \$184.3 billion in 2014 (in current dollars). The U.S. imports more transportation services (e.g., revenue from inbound cargo of U.S. ocean carriers) than it exports (e.g., revenue from outbound cargo of U.S. ocean carriers). However, since 2007 exports have comprised an increased share of all transportation services traded. In 2014 the value of transportation services exported (\$90.0 billion) was 95.6 percent of the value of transportation services imported (\$94.2 billion) [USDOC BEA International Services 2015].

⁴ Includes automotive vehicles, parts, and engines; civilian aircraft, engines, and parts; and other transportation equipment.

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